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Software Requirements Specification for the GIS-T/ISTEA Pooled Fund Study Phase C Linear Referencing Engine

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Microfiche copy: A01

SAND 97-1234
Unlimited Release
Printed June 1997

Distribution
Category UC-405

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Abstract

This Software Requirements Specification (SRS) describes the features to be provided by the software for the GIS-T/ISTEA Pooled Fund Study Phase C Linear Referencing Engine project. This document conforms to the recommendations of IEEE Standard 830-1984, IEEE Guide to Software Requirements Specification (Institute of Electrical and Electronics Engineers, Inc., 1984). The software specified in this SRS is a proof-of-concept implementation of the Linear Referencing Engine as described in the GIS-T/ISTEA Pooled Fund Study Phase B Summary, specifically Sheet 13 of the Phase B object model. The software allows an operator to convert between two linear referencing methods and a datum network.

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Software Requirements Specification for the GIS-T/ISTEA Pooled Fund Study Phase C Linear Referencing Engine

1. INTRODUCTION

This Software Requirements Specification (SRS) describes the features to be provided by the software for the GIS-T/ISTEA Pooled Fund Study Phase C Linear Referencing Engine project. This document conforms to the recommendations of IEEE Standard 830-1984, IEEE Guide to Software Requirements Specification (Institute of Electrical and Electronics Engineers, Inc., 1984).

1.1 Purpose

This SRS documents the functional requirements for the **Linear Referencing software**. The SRS serves as a statement of understanding between the end users of the software and the software developer of that product. Any desired departures from the specifications described herein should be negotiated by the affected parties.

1.2 Scope

Refer to the Pooled Fund Study Phase B Summary binder for a description of the Linear Referencing component.

1.3 Definitions, Acronyms, and Abbreviations

Refer to NCHRP 20-27(2) for definitions of transportation components.

All values which are used to describe performance or capacities are underlined.

1.4 References

- *IEEE Standard 830-1984, IEEE Guide to Software Requirements Specifications* (Institute of Electrical and Electronics Engineers, Inc., 1984)
- *Geographic Information Systems-Transportation ISTEA Management Systems Server-Net Prototype Pooled Fund Study Phase A Summary*, June 1994.
- *Geographic Information Systems-Transportation ISTEA Management Systems Server-Net Prototype Pooled Fund Study Phase B Summary*, April 1995.
- Vanderohe, Alan, et al., "A Report on the Results of a Workshop on a Generic Data Model for Linear Referencing Systems," National Cooperative Highway Research Program 20-27(2), 1994.

1.5 Overview

The organization of this SRS conforms to the Prototype SRS Outline given in IEEE 830-1984. The Specific Requirements section follows the Section 3 Prototype Outline 1 given in IEEE 830-1984.

2. GENERAL DESCRIPTION

2.1 Product Perspective

This product is a proof-of-concept implementation of the Linear Referencing Engine described in the Pooled Fund Study Phase B. The Phase B object model Sheet 13 is the specific component implemented.

2.2 Product Functions

This product allows an operator to convert between two linear referencing systems and a datum network.

2.3 User Characteristics

Users must be familiar with the basic ideas presented in the Vanderohe NCHRP 20-27(2) paper, specifically regarding the relationship of systems, traversals, reference posts, milepoints, and anchor sections. Users may also be familiar with the Pooled Fund Study Phase B object model, which defines the internal structure of the product.

2.4 General Constraints

This product must implement the Location Referencing module as given in the Pooled Fund Study Phase B object model.

This product must run under Microsoft Windows on a PC-compatible hardware platform.

2.5 Assumptions and Dependencies

Orientation of links in a traversal is not given. For clarification, see section 3.6.1 Database, regarding table TRAVLINK.DBF.

3. SPECIFIC REQUIREMENTS

This section contains the specific software requirements for this product.

3.1 Functional Requirements

3.1.1 Convert reference post address to datum address

3.1.1.1 Introduction

A reference post address is a field address consisting of a post number plus an offset from that post. This field address must be converted into a datum address before it can be converted into any other field address. A datum address consists of an anchor section plus an anchor section offset.

3.1.1.2 Inputs

Reference post address consisting of the following items:

- System ID
- Traversal ID
- Reference post ID
- Reference post offset (this is an arbitrary input from the user)

3.1.1.3 Processing

This processing is accomplished by `TReferenceAddress.ConvertToDatum` and `DatumSite.Position`.

Procedural description:

The total link offset is the input reference post offset plus the link offset of the reference post.

Get the ordered list of anchor sections for the link that the reference post is on.

Iteratively subtract off each anchor section length from the total link offset until the total link offset is less than or equal to the current anchor section length. It will be \leq the current anchor section length if the reference post address falls on it.

Pseudo-code:

Determine which link the reference post is on, and the link offset of the post (`TRP-POST.DBF`)

Calculate the link offset = input reference post offset + post link offset

Look up list of all anchor sections for this link (`LINKSECT.DBF`)

For each anchor section for this link (`ANCHRSCT.DBF`)

 If this is the **first** anchor section on the link

 If this is the **only** anchor section on the link

 If the anchor section goes the same direction as the link

 Total link offset = From node offset + link offset

 Otherwise, the anchor section goes the opposite direction as the link

 Total link offset = From node offset - link offset

 Verify that the total link offset is not greater than the actual link length

 Done.

 Save section information and start processing next anchor section (skip to top of loop)

 If this is the **second** anchor section on the link

 If the anchor section goes the same direction as the link

$\text{Total link offset} = \text{From node link offset} + \text{link offset}$
 Otherwise, the anchor section goes the opposite direction as the link
 $\text{Total link offset} = \text{From node link offset} - \text{link offset}$
 If the total link offset is negative, that means the first section was reversed:
 Calculate positive total link offset.
 If the total link offset is less than or equal to the current anchor section length,
 The reference post address has been found.
 If the current anchor section goes the same direction as the link
 $\text{Anchor section offset} = \text{total link offset}$
 Otherwise the current anchor section goes the opposite direction as the link
 $\text{Anchor section offset} = \text{current anchor length} - \text{total link offset}$
 Done.
 Otherwise, the total link offset is greater than the current anchor section length
 Subtract off the current anchor section length to prepare for checking next anchor section:
 $\text{Total link offset} = \text{total link offset} - \text{current anchor length}$

3.1.1.4 Outputs

Datum address consisting of the following items:

- Anchor section ID
- Anchor section offset

3.1.2 Convert milepoint address to datum address

3.1.2.1 Introduction

A milepoint address is a field address consisting of a milepoint distance traveled along a traversal. This field address must be converted into a datum address before it can be converted into any other field address. A datum address consists of an anchor section plus an anchor section offset.

3.1.2.2 Inputs

A milepoint address consisting of the following items:

- System ID
- Traversal ID

Absolute milepoint along the traversal, currently specified only in miles. A resolution of hundredths of miles is supported.

3.1.2.3 Processing

This processing is accomplished by `TMilepointAddress.GetLink`, `TMilepointAddress.ConvertToDatum` and `DatumSite.Position`.

Procedural description:

Given the traversal, milepoint, and list of links making up this traversal, determine which link the milepoint lands on.

Calculate the link offset of the milepoint.

Get the ordered list of anchor sections for that link.

Iteratively subtract off each anchor section length from the link offset until the link offset is less than or equal to the current anchor section length. It will be \leq the current anchor section length if the milepoint address falls on it.

Pseudo-code:

Get the ordered list of all links for the input traversal. (TRAVLINK.DBF)

For each link

 If the milepoint is greater than the link length,

 Subtract the current link length from the milepoint

Following determination of a link and link offset, the pseudo code is identical to that described in the section on converting from a Reference Post address to a Datum address.

3.1.2.4 Outputs

Datum address consisting of the following items:

- Anchor section ID
- Anchor section offset

3.1.3 Convert datum address to reference post address

3.1.3.1 Introduction

3.1.3.2 Inputs

Input datum address consisting of the following items:

- System ID
- Traversal ID
- Anchor section ID
- Anchor section offset (this is an arbitrary input from the user)

3.1.3.3 Processing

Determining a reference post address from a datum address can be described as a two-step process:

1. Given the system ID, traversal ID, anchor section ID, and anchor section offset, determine the corresponding link ID and link offset.
2. Given the link ID and link offset, translate that into a reference post address (reference post ID and reference post offset).

The procedural and pseudo-code descriptions of these steps follows (database tables, .DBF, are listed where used):

1. Determine the link ID and link offset from system ID, traversal ID, and anchor section ID.

Procedural description:

Get list of links associated with the input anchor section.

Examine each link(s) with matching system and traversal until link and link offset are found.

 Traverse each anchor section associated with this link, looking for the input anchor section ID

 Meanwhile, accumulate the link offset until the anchor section ID is found

 When the anchor section is found, finish calculating the link offset

Pseudo-code:

For each link associated with the input anchor section ID, do the following: (LINKSECT.DBF)

 Find a link that has matching system ID and traversal ID. (TLINK.DBF)

 Populate the associated Tlink object and its FromNode and ToNode objects (TNODE.DBF)

 For each anchor section associated with this link, do the following: (LINKSECT.DBF)

 Get the endpoints and length for this anchor section. (ANCHRSCT.DBF)

 If this is the **first** anchor section of this link, try to place the datum address on it:

 If this is the **only** anchor section of this link

 Verify that the anchor section ID matches the input anchor section ID

 Verify that the anchor section ID matches the From and To node anchor section ID's

 Verify that the input anchor section offset falls between the node anchor offsets

 If the From node offset < To node offset

 Link offset = input anchor section offset - From node offset

 If the To node offset < From node offset

 Link offset = To offset - input anchor section offset

 Done with determining link ID and link offset

 Otherwise this is not the only anchor section of this link:

 Save this anchor section's ID, end points, and length.

 If this is the **second** anchor section of this link, determine if datum was on first link:

 If input section ID matches first anchor section ID, determine first section orientation:

 If second section connects to the head of the first section

 Verify input section offset falls on first section (Input offset < From node offset)

 Link offset = input anchor section offset - From node offset

 Done with determining link ID and link offset

 If second section connects to the tail of the first section

 Verify input section offset falls on the first section (Input offset > From node offset)

 Link offset = From node offset - input anchor section offset

 Done with determining link ID and link offset

 If input section ID does not match first anchor section ID, update accumulated link offset:

 If second section connects to the head of the first section

 Accumulated link offset = First section length - From node offset

 If second section connects to the tail of the first section

 Accumulated link offset = From node offset

 If this is the **third or greater** anchor section of this link, determine if datum on previous link:

 If input section ID matches previous section ID, determine previous section orientation:

 If current section connects to the head of the previous section

 Link offset = Accumulated link offset + input anchor section offset

 Done with determining link ID and link offset

If current section connects to the tail of the previous section

Link offset = Accumulated link offset + (previous section length - input offset)

Done with determining link ID and link offset

If input section ID does not match previous section ID, update total length of link so far:

Accumulated link offset = accumulated link offset + previous anchor length

If the current anchor section ID matches the input anchor section ID, datum is on current section

If head of current section connects to previous section

Verify input anchor section offset \leq To node offset

Link offset = Accumulated link offset + input anchor section offset

Done with determining link ID and link offset

If tail of current section connects to previous section

Verify input anchor section offset \geq To node offset

Link offset = Accumulated link offset + (current section length - input section offset)

Done with determining link ID and link offset

2. Translate link ID and link offset into reference post address, which consists of a reference post ID and a reference post offset.

Procedural description:

Get the ordered list of reference points for this link (list of reference posts for this link is ordered by link offset, from least to greatest).

Determine the closest reference post in the negative direction to the input link offset by examining each post's link offset until a post's link offset is found that exceeds the input link offset. Then the closest post in the negative direction is the immediately previous post.

Determine the reference post offset by subtracting the post's link offset from the input link offset, or if the initial post's link offset already exceeds the input link offset, then the post offset will be negative.

Pseudo-code:

For each reference post on this link, do the following: (TRP_POST.DBF)

If this post's link offset is greater than the input link offset, then

If this is the first post on this link

Post ID = Current post ID

Post offset = Link offset - Post link offset (negative quantity)

If this is not the first post on the link

Post ID = Previous post ID

Post offset = Link offset - Previous post link offset

3.1.3.4 Outputs

Reference post address consisting of the following items:

- Reference post ID
- Reference post offset

3.1.4 Convert datum address to milepoint address

3.1.4.1 Introduction

3.1.4.2 Inputs

Input datum address consisting of the following items:

- System ID
- Traversal ID
- Anchor section ID
- Anchor section offset

3.1.4.3 Processing

Determining a milepoint address from a datum address can be described as a two-step process:

1. Given the system ID, traversal ID, anchor section ID, and anchor section offset, determine the corresponding link ID and link offset.
2. Given the link ID and link offset, translate that into a milepoint address along the input traversal.

Step 1 is identical to that in the previous section, 3.1.3 Convert datum address to reference post address. Consult that section for details on Step 1.

Step 2 is as follows:

Translate link ID and link offset into milepoint address, the absolute milepoint along the input traversal.

Procedural description:

Pseudo-code:

3.1.4.4 Outputs

Milepoint address consisting of an offset which indicates absolute milepoint along the input traversal.

3.2 External Interface Requirements

3.2.1 User Interface Requirements

The interface will be Microsoft Windows-based, but the linear referencing data will be presented textually rather than graphically.

3.2.2 Hardware Interface Requirements

None.

3.2.3 Software Interface Requirements

ARCinfo requires milepoint data, but the exact interface is still to be determined.

3.2.4 Communication Interface Requirements

None.

3.3 Performance Requirements

Completion of all calculations should not take longer than 60 seconds.

3.4 Design Constraints

3.4.1 Standards Compliance

This product uses the standard terminology given in NCHRP 20-27(2) and the Pooled Fund Study Phase A and Phase B summaries.

3.4.2 Hardware Limitations

None.

3.5 Attributes

3.5.1 Security

N/A

3.5.2 Maintainability

N/A

3.5.3 Availability

N/A

3.5.4 Transferability/Conversion

When moving this product to another platform, the path for the database alias LRMtest must be changed to reflect the actual location of the LRM test databases. This can be done either through the Delphi Database Engine Configuration or through the Delphi Database Desktop.

3.6 Miscellaneous Requirements

3.6.1 Data Base

The following database tables must exist in order for this product to function. They must use the exact names and structure as given below. All files are in dBASE IV format. All files are unordered (records are in no particular order).

Because of naming constraints, no more than 99 each of anchor points, anchor sections, links, nodes, traversals, reference posts, or milepoints are supported, with names 'X01' through 'X99', where 'X' is one of 'A', 'S', 'L', 'N', 'H', 'R', and 'M' respectively.

Filename: **ANCHORPT.DBF**

Contents: All anchor points.

Field name	Type	Size	Notes or example
ANCHOR_PT	C	3	'A02'
DESCR	C	65	
LOCATION	C	65	GPS location string

Filename: **ANCHRSCT.DBF**

Contents: All anchor sections.

Field name	Type	Size	Example or notes
SECTION_ID	C	3	'AS3'
FROM_PT	C	3	'A02'
TO_PT	C	3	'A03'
DISTANCE	N	6:2	0.04
UNITS	C	10	'Miles'

Filename: **LINKSECT.DBF**

Contents: All links and the one or more associated anchor sections.

Field name	Type	Size	Example or notes
LINK_ID	C	3	'L07'
SECTION_ID	C	3	'AS3'
ORDINAL	N	2:0	3

Filename: **SYSTEM.DBF**

Contents: All systems.

Field name	Type	Size	Example or notes
SYSTEM_ID	C	3	'S02'
CLASS	C	10	'SR'
NAME	C	65	'State roads'

Filename: **TLINK.DBF**

Contents: All links.

Field name	Type	Size	Example or notes
LINK_ID	C	3	'L07'
FROM_NODE	C	3	'N06'
TO_NODE	C	3	'N07'
WEIGHT	N	6:2	1.36
UNITS	C	10	'Miles'
SYSTEM_ID	C	3	'S02'
TRAVERSAL	C	3	'H03'
LINK_OPEN	L		True

Filename: **TNODE.DBF**

Contents: All nodes.

Field name	Type	Size	Example or notes
NODE_ID	C	3	'N36'
ANCH_SECT	C	3	'AS5'
ANCH_OFFS	N	6:2	3.51
DESCR	C	65	'?'
NODE_OPEN	L		True

Filename: **TRAVLINK.DBF**

Contents: All traversals and the one or more associated link.

Field name	Type	Size	Example or notes
TRAV_ID	C	3	'H45'
LINK_ID	C	3	'L22'
ORDINAL	N	2:0	8

Filename: **TRP-MILE.DBF**

Contents: All milepoints.

Note -- This file is superfluous, as the From Node on each link always milepoint 0.

Field name	Type	Size	Example or notes
MPT_ID	C	3	'M40'
TRAVERSAL	C	3	'H17'
LINK_ID	C	3	'L26'

Filename: **TRP-POST.DBF**

Contents: All reference posts.

Field name	Type	Size	Example or notes
POST_ID	C	3	'R52'
DESCR	C	65	'SR-15 on and off ramps'
TRAVERSAL	C	3	'H11'
LINK_ID	C	3	'L14'
LINK_OFFS	N	6:2	1.45

Filename: **TRV-HWY.DBF**

Contents: All highway traversals.

Field name	Type	Size	Example or notes
TRAV_ID	C	3	'H12'
SYSTEM_ID	C	3	'S01'
NUMBER	C	10	'114'
NAME	C	65	'Central Avenue'
DIRECTION	C	1	'W'

3.6.2 Operations

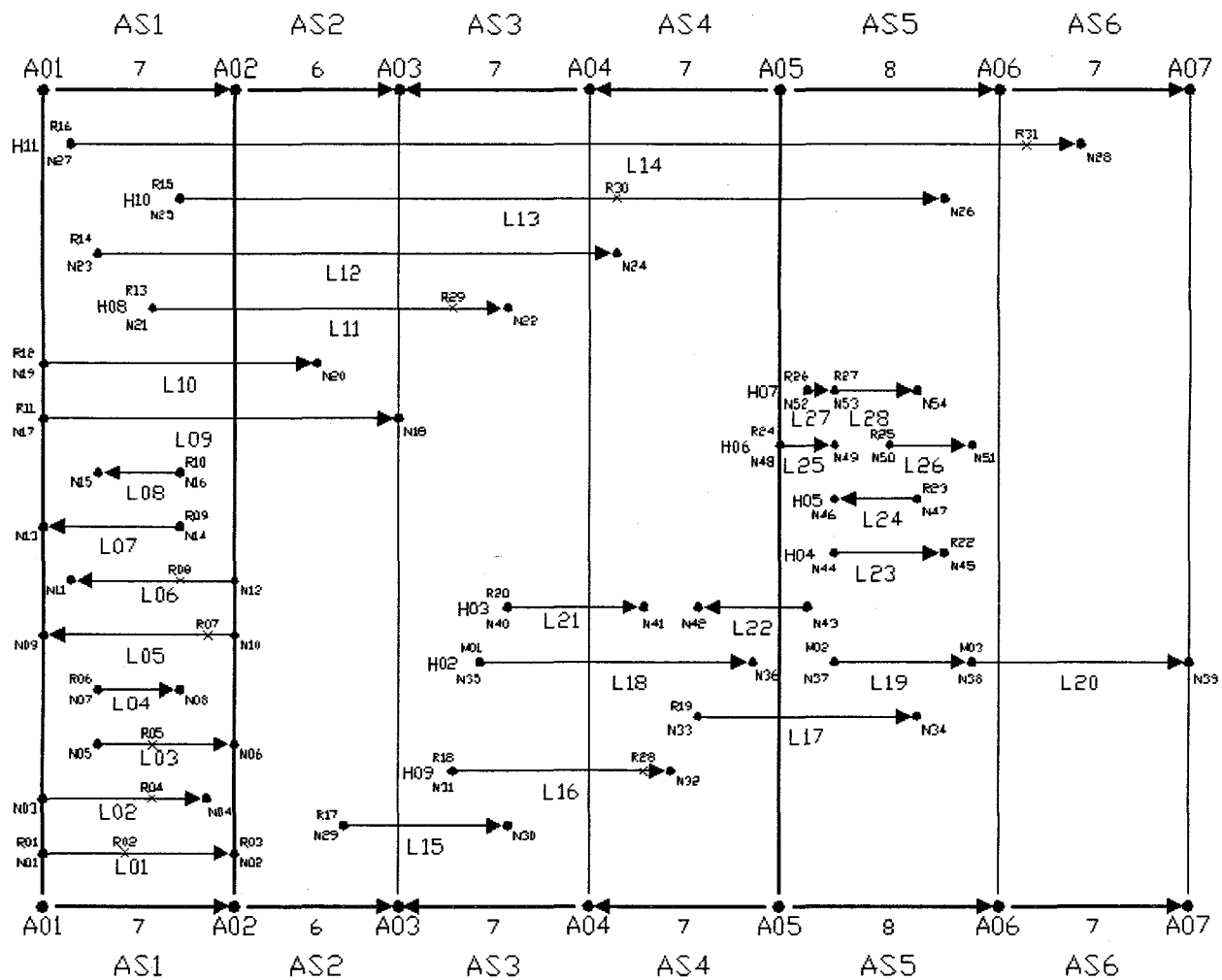
Not applicable

3.6.3 Site Adaptation

Upon installation of the product, the user must run the Delphi Database Engine Configuration from the Delphi group in Windows. Under the Aliases tab, create a new alias 'LRMtest' with the pathname to the directory containing the database tables shipped with the LRM executable.

4. APPENDIX A: TEST CASES

The test cases correspond to the test network graphed below.



The following cases test the correct conversion of Reference Post address to Datum Address. The second Reference Post output in a Post+offset cell is the observed Reference Post output, mapped to the first traversal looked up in the reverse algorithm.

ID	Input			Expected output		Explanation of test case
	Sys	Trav	Post+offset	Datum	Mpt	
	S01	H01	R01+0.00	AS1+0.00	0.00	Nominal, beginning of link, same dir
	S01	H01	R02+0.00	AS1+0.03	0.03	Middle of link
	S01	H01	R03+0.00	AS1+0.07	0.07	End of link
	S01	H01	R04+0.00	AS1+0.04	0.04	Same dir, link shorter than section at head
	S01	H01	R05+0.00	AS1+0.04	0.04	Same dir, link shorter at tail
	S01	H01	R02+0.01			
	S01	H01	R06+0.00	AS1+0.02	0.02	Same dir, link entirely in section
	S01	H01	R01+0.02			
	S01	H01	R07+0.00	AS1+0.06	0.06	Link opposite dir, full span over section
	S01	H01	R02+0.03			
	S01	H01	R08+0.00	AS1+0.05	0.05	Opposite dir, link shorter at head
	S01	H01	R02+0.02			
	S01	H01	R09+0.00	AS1+0.05	0.05	Opposite dir, link shorter at tail
	S01	H01	R02+0.02			
	S01	H01	R10+0.00	AS1+0.05	0.05	Opposite dir, link entirely in section
	S01	H01	R02+0.02			
	S01	H01	R11+0.00	AS1+0.00	0.00	Nominal, beginning of link, same dir
	S01	H01	R01+0.00			
	S01	H01	R11+0.13	AS2+0.06	N/A	End of second section, same dir
	S01	H01	R12+0.00	AS1+0.00	0.00	Nominal, beginning of link, same dir
	S01	H01	R01+0.00			
	S01	H01	R14+0.00	AS1+0.02	0.02	Nominal, beginning of link, same dir
	S01	H01	R01+0.02			
	S01	H01	R17+0.00	AS2+0.04	N/A	Nominal, beginning of link, same dir
	S01	H01	R11+0.11			
	S01	H01	R19+0.00	AS4+0.03	N/A	Nominal, beginning of link, opposite dir
	S01	H01	R14+0.22			
	S01	H08	R13+0.00	AS1+0.04	0.00	Nominal, beginning of link, same dir
	S01	H08	R13+0.04	AS2+0.01	0.04	Crossing head to tail section join
	S01	H01	R17+0.04	AS3+0.05	N/A	Crossing head to head section join
	S01	H01	R11+0.15			
	S01	H09	R18+0.06	AS4+0.06	0.06	Crossing tail to head section join
	S01	H01	R19+0.04	AS5+0.01	N/A	Crossing tail to tail section join
	S01	H01	R02+0.04	AS1+0.07	0.07	Nominal, same dir, plus offset
	S01	H01	R03+0.00			
	S01	H01	R07+0.04	AS1+0.02	0.02	Nominal, opposite dir, plus offset
	S01	H01	R01+0.02			
	S01	H01	R08+0.04	AS1+0.01	0.01	Opposite dir, to end of link
	S01	H01	R01+0.01			
	S01	H09	R18+0.00	AS3+0.05	0.00	Nominal, beginning of link, opposite dir

The following cases test the correct conversion of Milepoint Address to Datum Address.

ID	Input			Expected output		Explanation of test case
	Sys	Trav	Mpt	Datum	Post+offset	
	S01	H02	0.00	AS3+0.04	N/A	Nominal
	S01	H02	0.04	AS3+0.00	N/A	Offset to section boundary
	S01	H02	0.10	AS4+0.01	N/A	End of section
	S01	H02	0.11	AS5+0.03	N/A	Over discontinuity between links
	S01	H02	0.15	AS5+0.07	N/A	End of second link
	S01	H02	0.16	AS5+0.08	N/A	Third link
	S01	H02	0.23	AS6+0.07	N/A	End of third link

The following cases test the correct conversion of Reference Post address to Datum address and then to Milepoint address.

ID	Input			Expected output		Explanation of test case
	Sys	Trav	Post+offset	Datum	Mpt	
	S01	H11	R16+0.00	AS1+0.01	0.00	Nominal, beginning of link, same dir
	S01	H11	R16+0.06	AS1+0.07	0.06	Section boundary
	S01	H11	R16+0.07	AS2+0.01	0.07	Crossing head to tail section join
	S01	H11	R16+0.14	AS3+0.05	0.14	Third section, head to head join
	S01	H11	R16+0.21	AS4+0.05	0.21	Fourth section, tail to head join
	S01	H11	R16+0.29	AS5+0.03	0.29	Fifth section, tail to tail join
	S01	H11	R16+0.37	AS6+0.03	0.37	End, sixth section, head to tail join
			R31+0.02			

The following cases test the correct conversion of traversal Milepoint address to Reference Post address. The Datum Address is listed for completeness.

ID	Input			Expected output		Explanation of test case
	Sys	Trav	Mpt	Post+offset	Datum	
	S01	H01	0.00	R01+0.00	AS1+0.00	Exactly on repost
	S01	H01	0.02	R01+0.02	AS1+0.02	Repost plus offset
	S01	H01	0.03	R02+0.00	AS1+0.03	Repost nearness math. Not R01+0.03.
	S01	H04	0.03	R22+0.01	AS5+0.05	Repost occurs at end of link, neg offset
	S01	H04	0.04	R22+0.00	AS5+0.06	Repost occurs at end of link, zero offset
	S01	H05	0.00	R23+0.00	AS5+0.05	Link goes opposite direction of section.
	S01	H05	0.01	R23+0.01	AS5+0.04	Link goes opposite section, offset math
	S01	H07	0.04	R27+0.01	AS5+0.03	Milepoint spans two links
	S01	H08	0.10	R13+0.10	AS3+0.06	Link spans three sections
	S01	H09	0.00	R18+0.00	AS3+0.05	Link goes opposite direction of section
	S01	H09	0.02	R18+0.02	AS3+0.03	Link goes opposite section, offset math
	S01	H09	0.07	R28+0.00	AS4+0.05	Link spans two opposite dir sections
	S01	H10	0.04	R15+0.04	AS2+0.02	Link spans two same direction sections
	S01	H10	0.11	R15+0.11	AS3+0.04	Link spans three sections
	S01	H10	0.23	R30+0.07	AS5+0.01	Link spans five sections
	S01	H11	0.35	R31+0.00	AS6+0.01	Link spans six sections, zero offset

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1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in financial matters. The text suggests that organizations should implement robust systems to track every aspect of their operations, from procurement to sales.

2. The second part of the document addresses the challenges faced by organizations in managing their resources effectively. It highlights the need for strategic planning and the allocation of resources based on long-term goals. The author argues that without a clear vision and a well-defined strategy, organizations risk inefficiency and failure. It provides several examples of how successful organizations have overcome these challenges through innovative management practices.

3. The third part of the document focuses on the role of leadership in driving organizational success. It discusses the qualities of effective leaders, such as vision, integrity, and the ability to inspire others. The text suggests that leaders should foster a culture of innovation and collaboration, encouraging employees to take initiative and contribute to the organization's growth. It also emphasizes the importance of communication and the ability to listen to feedback from all levels of the organization.

4. The fourth part of the document explores the impact of technology on modern organizations. It discusses how digital tools and platforms have transformed various aspects of business, from marketing and sales to production and distribution. The text suggests that organizations should embrace technology and invest in digital infrastructure to remain competitive in the global market. It also touches upon the importance of data security and privacy in the digital age.

5. The fifth and final part of the document provides a conclusion and offers some final thoughts on the key themes discussed. It reiterates the importance of continuous improvement and the need for organizations to stay agile in a rapidly changing environment. The author encourages readers to reflect on the lessons learned and apply them to their own organizations to achieve sustainable success.